

Help Yourself to Science

by
N. A. WATTS



BOOK
ONE



ORIENT

LONGMANS

470



HELP YOURSELF TO SCIENCE

BOOK ONE

A WORKBOOK TO ACCOMPANY

Adventures in Tropical Science, Book I

By

N. A. WATTS, B.SC., B.T., A.B.T.I.



ORIENT LONGMANS

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PREFACE

THE analysis, identification, measurement and evaluation of the abilities of pupils that underlie and condition achievement in Science constitute the peak-point of the use of self-tests in modern, enlightened teaching practice. The self-tests in **HELP YOURSELF TO SCIENCE** are an important device in the teacher's diagnostic equipment, for they have been specially designed to test the mental ability of the pupil, not only from the viewpoint of content mastery, but have also taken into account other learning products which include such aspects as thinking skills and desirable attitudes.

Teachers will find that these informal objective tests inject a surprisingly large degree of accuracy into their methods of diagnosis, measurement and evaluation. Through the use of these adequately valid and reliable measuring devices, teachers will obtain precise, instructional information concerning the abilities and limitations of their pupils, of individual pupil differences in capacity and achievement and the status of achievement of the class as a whole.

The Workbooks will keep the pupil informed of his progress and this will inevitably serve as further incentive to greater effort. The tests will aid the pupil to check and marshal his grasp of the text and give him practice in the skills of collecting data, solving problems, applying his understanding to everyday situations and in this way, further reinforce his command of the subject.

These tests, chiefly because of their definiteness and objectivity, will also reveal to the teacher the extent of efficiency of certain special methods of instruction he has employed, while special types of emphasis he has used will be brought into sharp focus from a critical analysis and interpretation of the test results. The results will also give the teacher evidence of pupils' progress towards specific goals of achievement : their ability to express their knowledge, the extent of their understanding of the science vocabulary used in the text, their mastery of facts, their growth in scientific attitudes, interests and appreciations and their proficiency in using their freshly acquired skills to identify, attack and solve problems. Furthermore, the results will provide the teacher with a basis for the objective grade placement of pupils.

HELP YOURSELF TO SCIENCE is purposely designed to ensure maximum activity on the part of the pupil. The learning experiences in the series have been styled and organised to involve the pupil in the process of learning about science, for it is such involvement in a meaningful learning experiment which is directed towards the accepted objectives of science teaching, that will further vitalise his study of the texts and serve to develop, clarify and enrich his science understandings. These thought-provoking, study-helps are planned to raise the pupil out of the mire of conventional memorisation of factual material and the traditional tendency to cast all instruction into the mould of mere assimilation of subject matter; they aim at providing guidance to first-hand experiences which offer the pupil abundant opportunities to effectively translate into action his newly acquired knowledge in the world outside the classroom. Accordingly, specific directions are given for independent and group investigation and experimentation which focus on the major concepts and principles presented in the texts, so that the pupil may experience the thrill of active participation as he explores his environment to collect the evidence he requires to facilitate his learning of the subject.

Properly exploited by the teacher the suggested experiences in each Workbook may well open new avenues of interest and satisfaction to the pupil besides amplifying and extending the corresponding text which it accompanies, thereby contributing to overall understanding and fulfilling the triple function for which it has been designed—to serve as a testing, a learning and a teaching aid.

Each Workbook contains tests which are constructed parallel to the chapters in the text-book it accompanies, so that the student's mastery of each chapter is facilitated. At the end of the book are tests which require the integration of the knowledge gained in the preceding chapters in order to be answered correctly.

The sheets in the Workbook may be distributed separately in schools where a loose-leaf file is in use for the subject, or the Workbook can be used intact. In either case, the corrected exercises should be readily available as a reference for study and review.

ADVENTURES IN TROPICAL SCIENCE

FOR JUNIORS

A simple introductory series
to the study of General Science
for schools in India

Book 1. For pupils up to the age of 8

Book 2. " " " " " " " 9

Book 3. " " " " " " " 10

Book 4. " " " " " " " 11

Book 5. " " " " " " " 12

HELP YOURSELF TO SCIENCE

A series of five Workbooks
to accompany each text-book

FOR TEACHERS ONLY

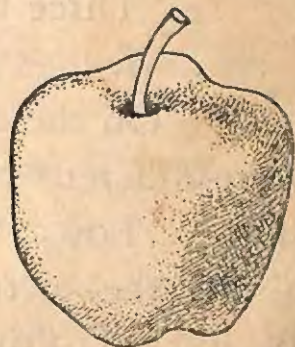
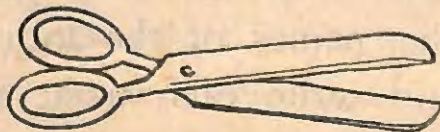
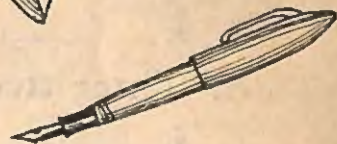
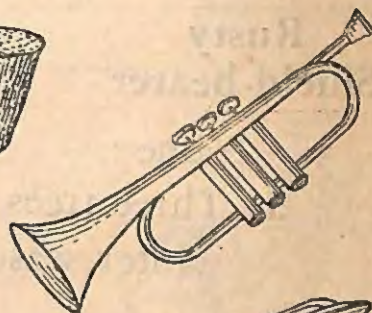
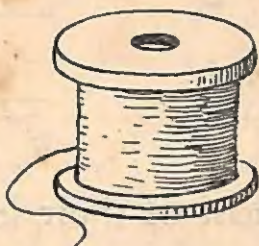
Teachers who wish to have the answers to any of the Self-testing
Exercises in this workbook should address their enquiries to:

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Four Common Trees

1. Draw arrows which point from the tree towards the things trees give us.



2. Fill in this table.

<i>Name of tree</i>	<i>Colour of flower</i>	<i>Shape of fruit</i>	<i>Colour of fruit</i>
Red Silk Cotton			
Rain-tree			
Gul Mohr			
Rusty Shield-bearer			

3. Name :

a. Three trees that lose most of their leaves during the winter season.

i. _____ ii. _____ iii. _____

b. Three trees that you see on your way to school.

i. _____ ii. _____ iii. _____

c. Three trees that grow in your school compound.

i. _____ ii. _____ iii. _____

d. Three creatures that live in trees.

i. _____ ii. _____ iii. _____

e. Three parts of a tree.

i. _____ ii. _____ iii. _____

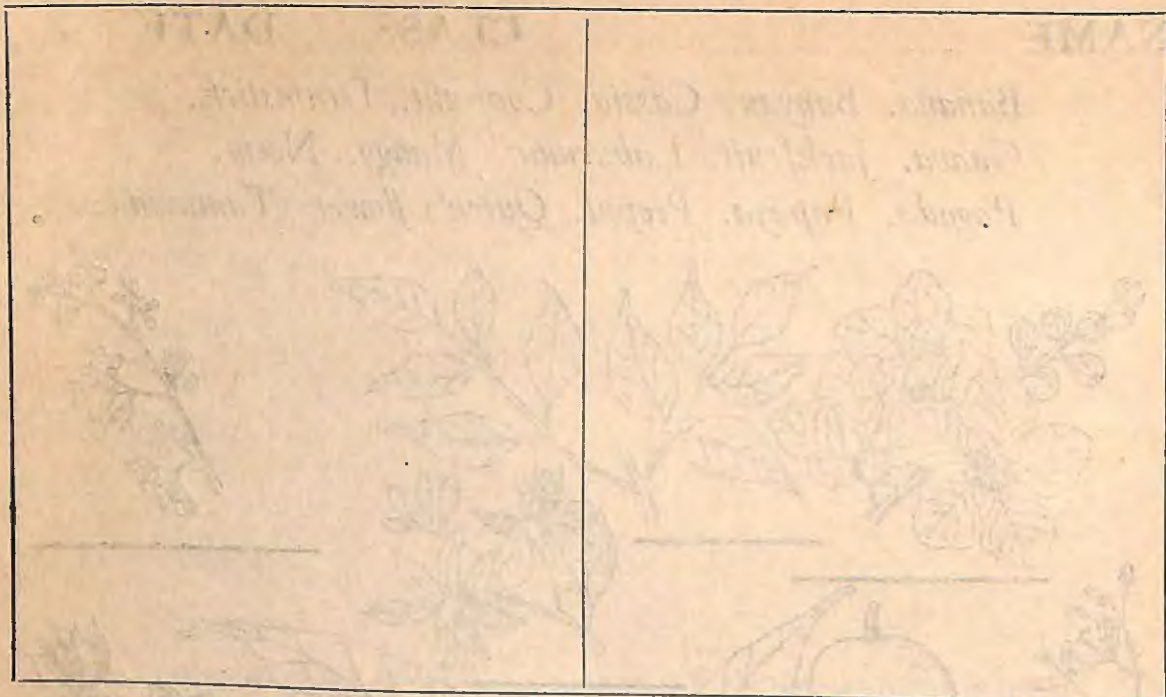
4. On the next page are the leaves, flowers and fruits of four different trees that may be found growing near your home. Look for the names of the four trees in the list above the picture and write each name near the drawing of its leaf, flower and fruit.

DATE _____

Pagoda. Papaya. Peepul. Queen's flower. Tamarind.

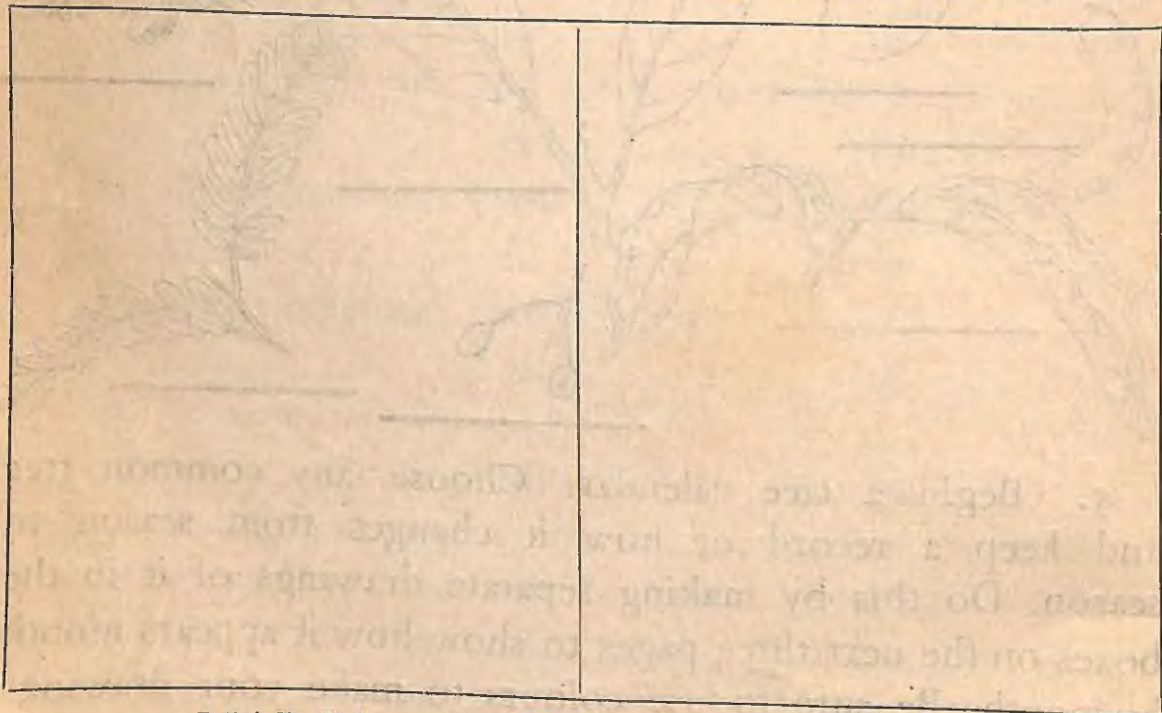


5. Begin a tree calendar. Choose any common tree and keep a record of how it changes from season to season. Do this by making separate drawings of it in the boxes on the next three pages to show how it appears month by month. Be sure to use colours to make your drawings look pretty.



JANUARY

FEBRUARY



MARCH

APRIL

NAME _____ CLASS _____ DATE _____

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MAY

JUNE

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JULY

AUGUST

5

SEPTEMBER

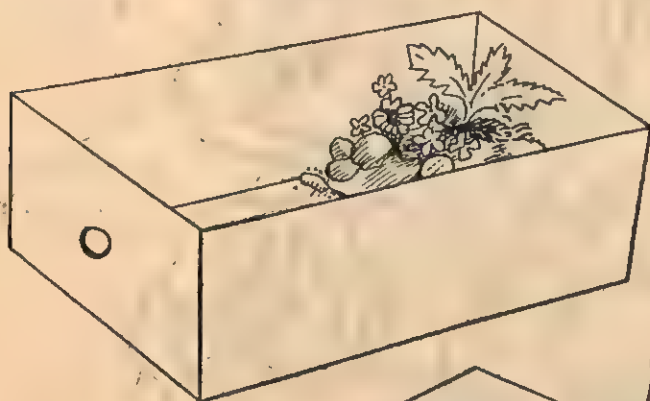
OCTOBER

NOVEMBER

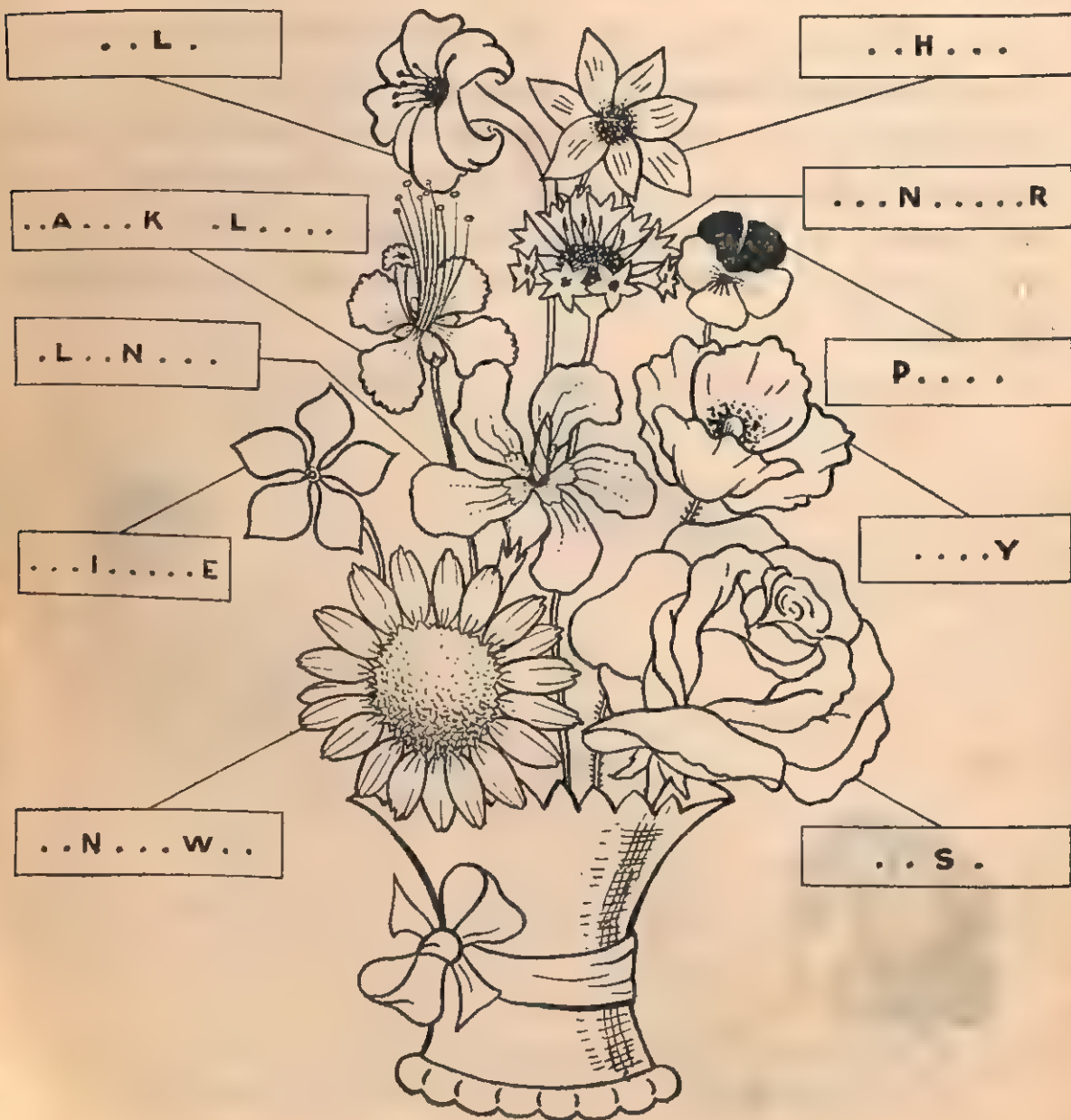
DECEMBER

A Flower Garden

1. You can make your own rock garden by arranging a few pebbles, flowers and twigs of fern in a shoe-box. A tiny mirror will serve as a pond. Keep your flowers fresh by putting their stems in small bottles containing water. Fix the bottles in lumps of clay or plasticine. Make a cellophane window at the top of the box and a peep-hole at the side.








2. This pretty basket of flowers requires labelling. Each dot represents a missing letter. Fill in the missing letters. Colour in the flowers by copying the colours from the real plants you have seen growing in the garden.



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3. The drawings in the boxes on the left hand side of this page show either the leaves or the fruits of five of the flowers pictured on page 8. Match each leaf or fruit with its flower by copying the drawing of its flower in the box alongside.

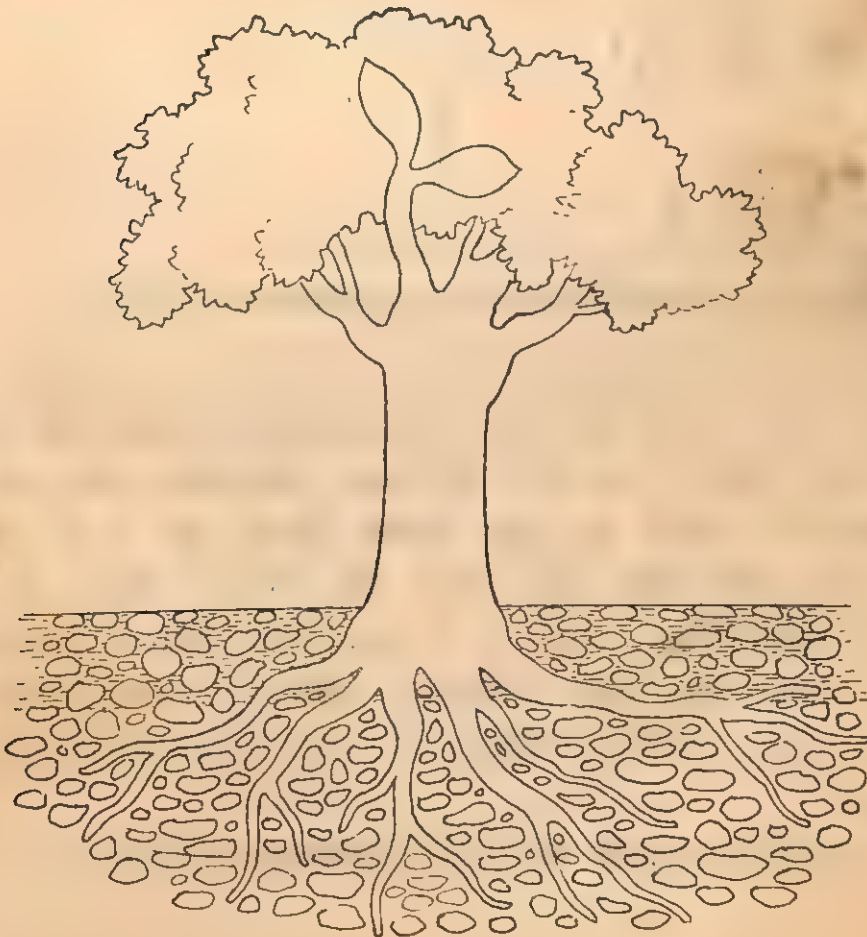
	
	
	
	
	

A black and white line drawing of a young boy with a dark, smudged face, looking directly at the viewer. He is surrounded by a chaotic, tangled mass of mechanical and electronic components, including wires, tubes, and a large, complex device on the right. The drawing is signed 'M. 1961' in the bottom right corner.

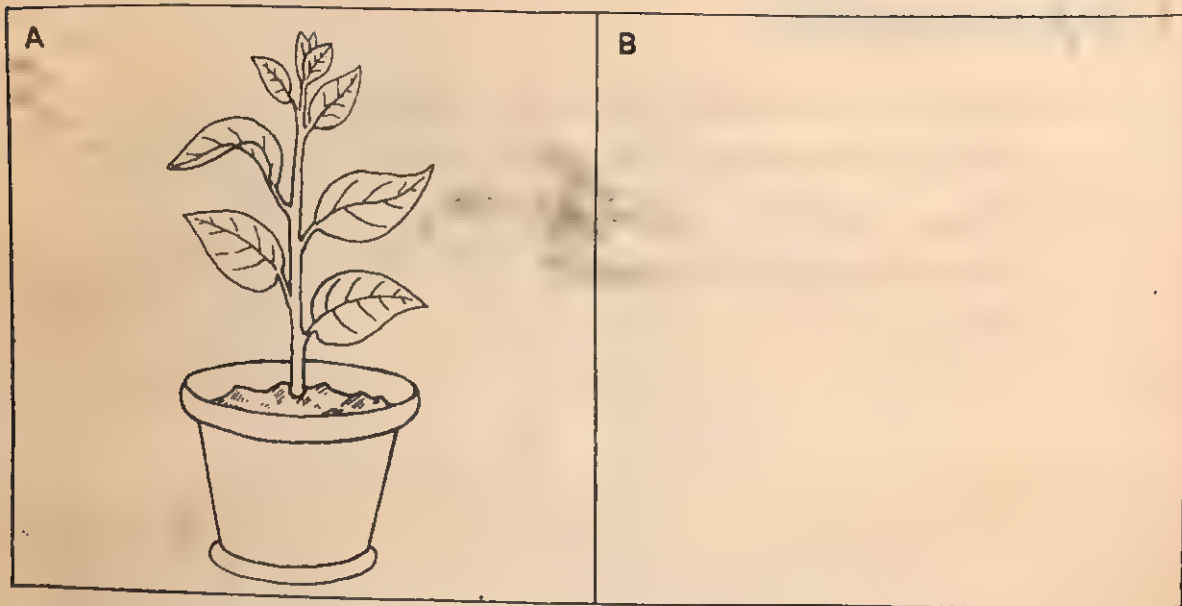


A Few Experiments

1. Label the following on the diagram.
 - a. Arrows to show the path of the water current.
 - b. These words: branches, roots, trunk.
 - c. A bracket to show how far water has entered the soil.



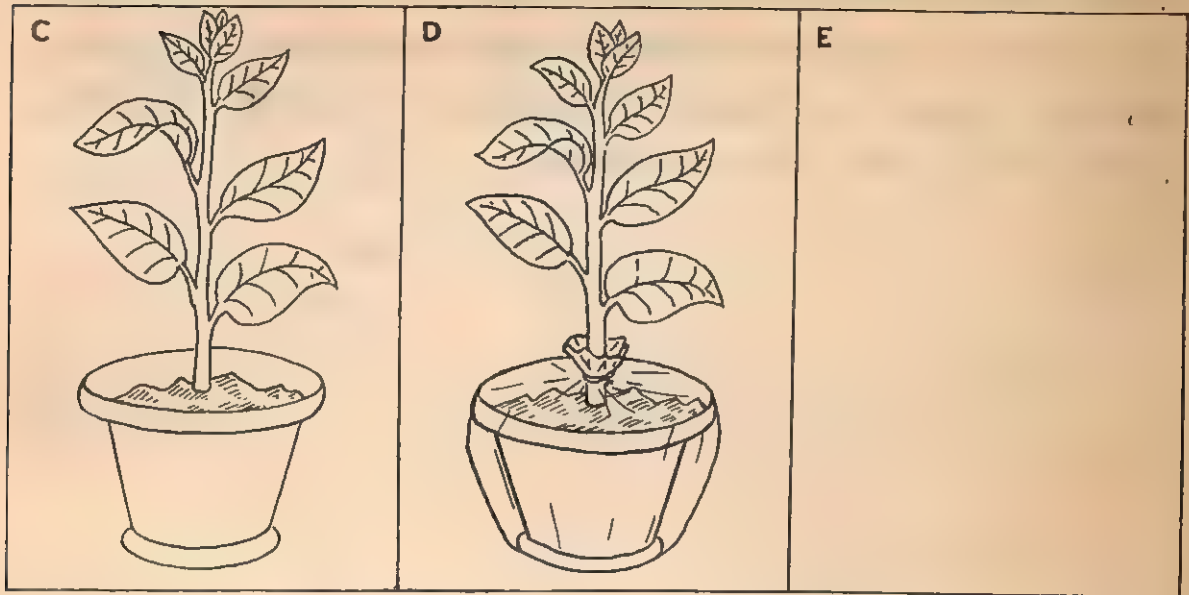
2. A potted plant which has regularly received water is drawn in box **A**. Draw the same in box **B** as you would expect it to look after it has been starved of water for a whole week.



What does the result of this experiment tell us?

3. In box **C** is another potted plant that has received water every day. Its pot is then covered with a plastic bag which is tied to the main stem so that the bag covers the pot, the soil and the roots. Box **D** shows how it looks after this is done. Thereafter the plant is watered every day for a week. Draw in box **E** the same plant as you would expect it to look at the end of the week.

What does the result of this experiment tell us?



4. State :

a. Three ways the gardener cares for his plants.

i. _____

ii. _____

iii. _____

b. The difference between the roots of a small plant and that of a tree.

c. Three things all plants require.

i. _____

ii. _____

iii. _____

d. A liquid that makes plant food available to the plant.

e. Two ways in which we are like plants.

i. _____

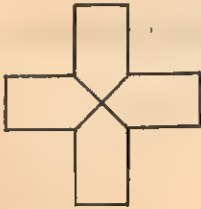

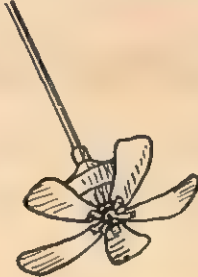


ii. _____

5. Explain, in your own words, how you would change the colour of white flowers to green. Draw in box **A** how your flowers would look before the experiment and, by means of another drawing in box **B**, how they would look after the experiment.

A	B

Looking inside a flower

1. Try to find flowers that have the following shapes. Draw and colour them in the boxes below the shapes they resemble. Find out the names of the flowers you draw and write them below each drawing.

2. Can you answer these questions ?

a. Why do most flowers have gaily-coloured petals ?

b. How do insects help the flowers to form fruits ?

c. What work is done by the sepals ?

d. How do the special markings on the petals help the bee ?

e. State two ways by which most flowers attract insects.

i. _____

ii. _____

3. Name :

a. Three flowers visited by butterflies.

i. _____

ii. _____

iii. _____

b. Three flowers visited by bumble-bees.

i. _____

ii. _____

iii. _____

c. Three flowers visited by honey-bees.

i. _____

ii. _____

iii. _____

d. Two flowers visited by birds.

i. _____

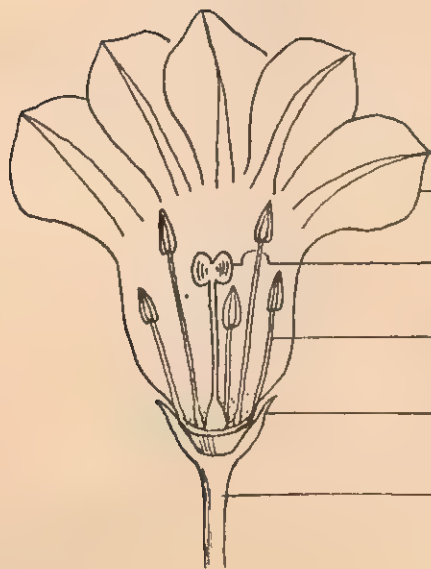
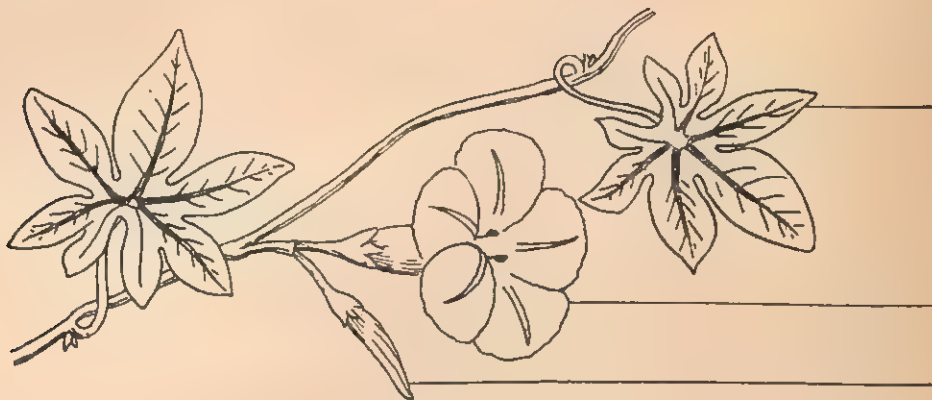
ii. _____

4. Fill in the blank spaces of this sentence with the correct numbers.

The flower of the Gul Mohr tree has _____ sepals,
_____ petals, _____ stamens and _____ pistil.

NAME _____ CLASS _____ DATE _____

5. The first picture shows a branch of the Railway Creeper. The second picture shows the flower after it has been torn open so as to show its inner parts. Label the pictures by writing the name of each part to which a guide line points.

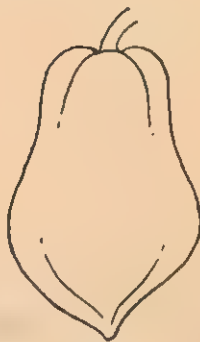


6. Fill in this table with details of the flowers you examine during your nature rambles.

[illegible]

From Bud to Fruit

1. Have you ever noticed how the colour of a fruit changes as it ripens? Colour in these drawings of fruits as they appear when ripe and fit to eat. Write the name of the fruit at the side of its drawing.



2. Keep a pictorial record of all that happens from the time your favourite plant produced a bud until the time its fruit was formed. The captions under each box will guide you in making your record.

The Bud	The Flower	The Insect Visitor
The Fruit (outside view)	The Fruit (inside view)	The Seed

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3. Here is a picture for you to colour. The name of the plant is Yellow Oleander; the bird is called the Purple Sunbird. Colour the leaves green and the flowers yellow. Colour the bird purple, but make the sides and back of its neck blue, its beak and feet black. Think of a caption to the picture and write it on the line below.



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4. Draw and colour :

In box A a fruit whose skin, flesh and seeds we eat.

In box B a fruit whose skin and flesh we eat.

In box C a fruit whose flesh and seeds we eat.

In box D a fruit whose flesh alone we eat.

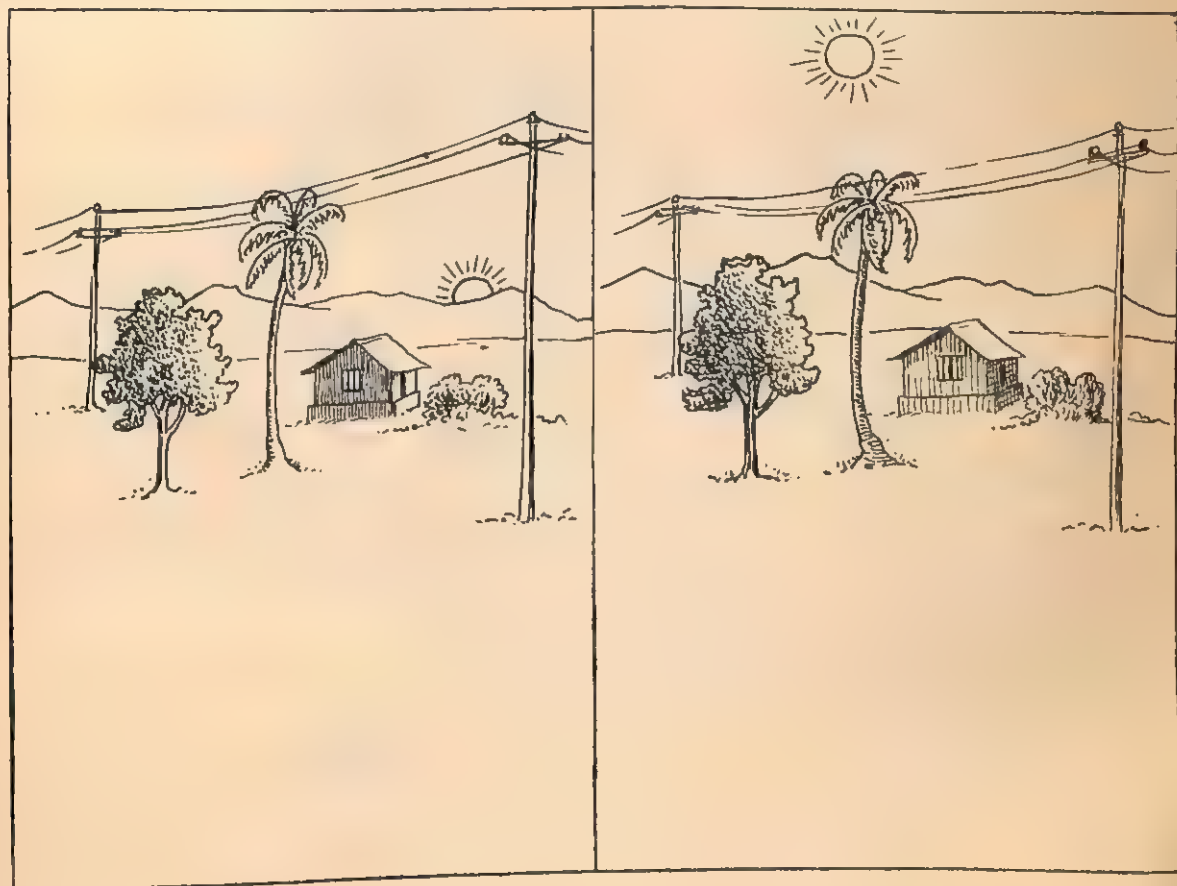
In box E a fruit whose seeds alone we eat.

In box F a dry fruit whose skin and seeds we eat.

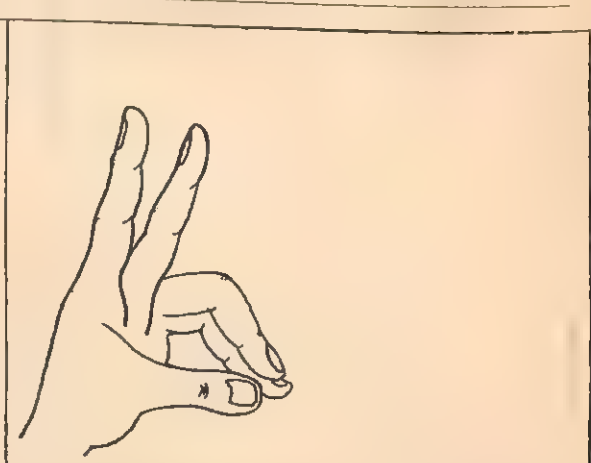
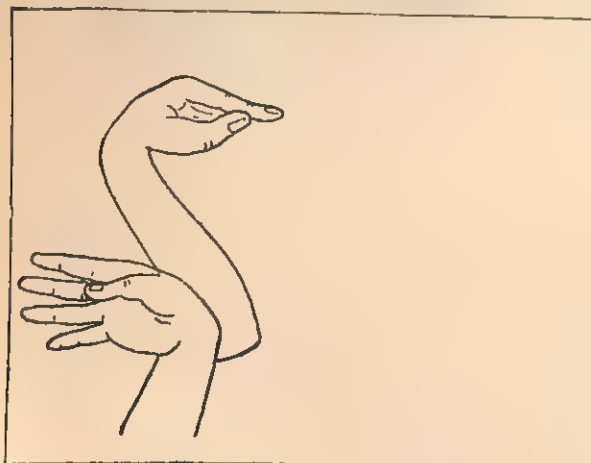
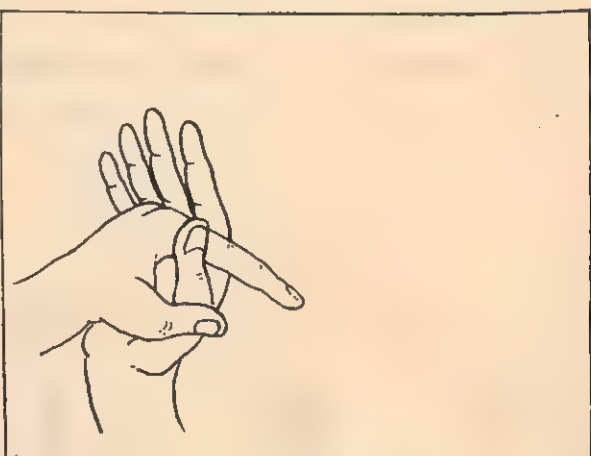
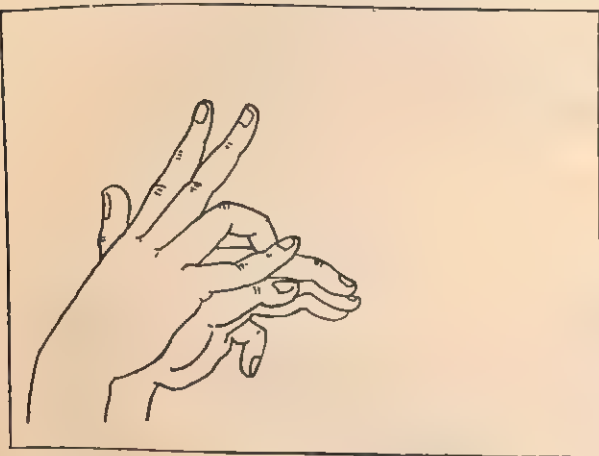
A	B	C
D	E	F

Sunlight and Shadow

1. The first picture shows an early morning scene. The second shows the sun in its noon position. Colour the scenes and draw the shadows cast by the sun. Give each picture a caption and write it below its picture.

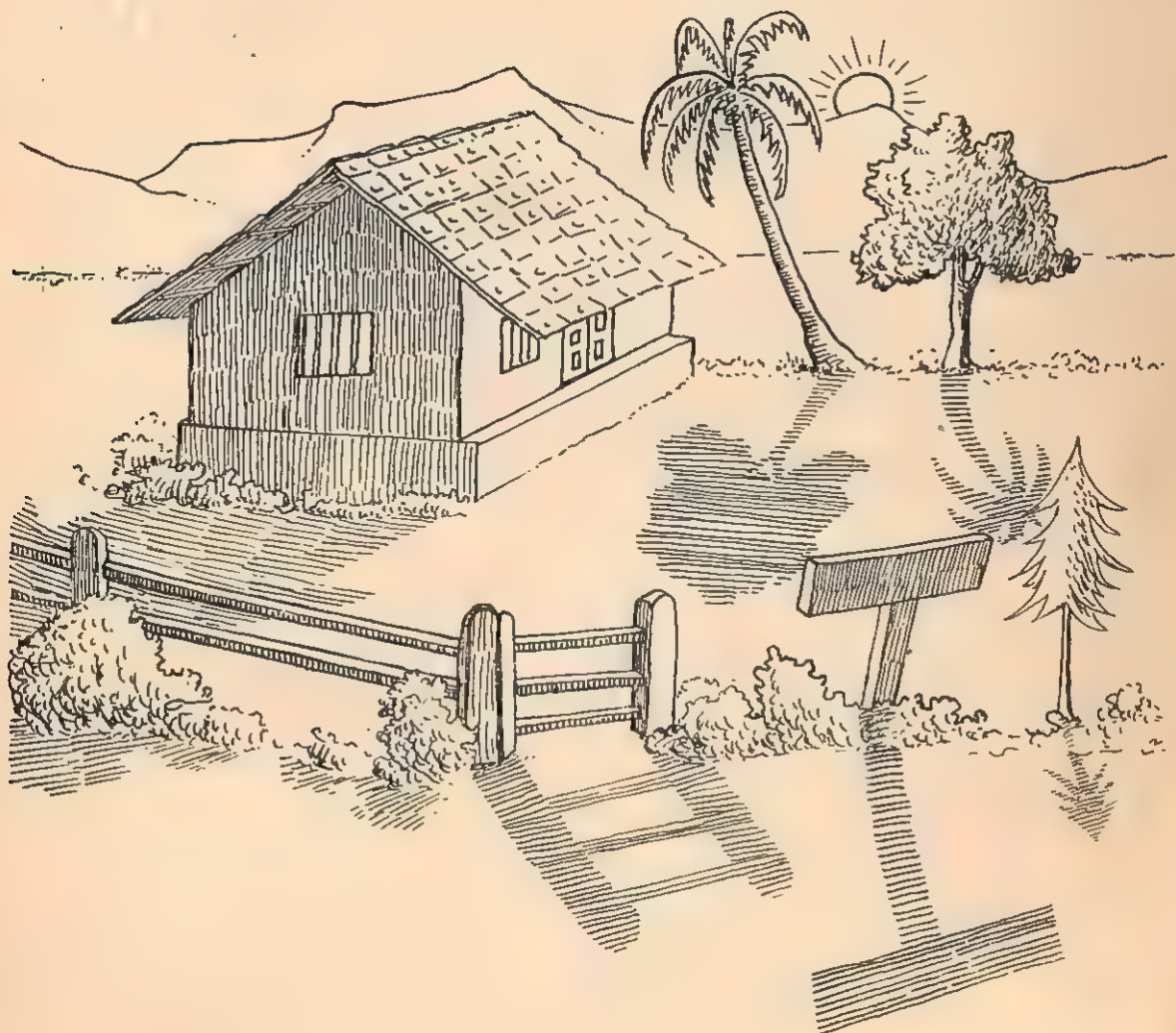


2. Here are a few more designs for making hand shadows. Draw the kind of shadow you would expect behind each pair of hands. Below each box are two lines. On the first line write what you think the shape of the shadow will resemble. On the second line, below the first, write what the shadow resembles after you have made it by arranging your hands and fingers in the manner shown.

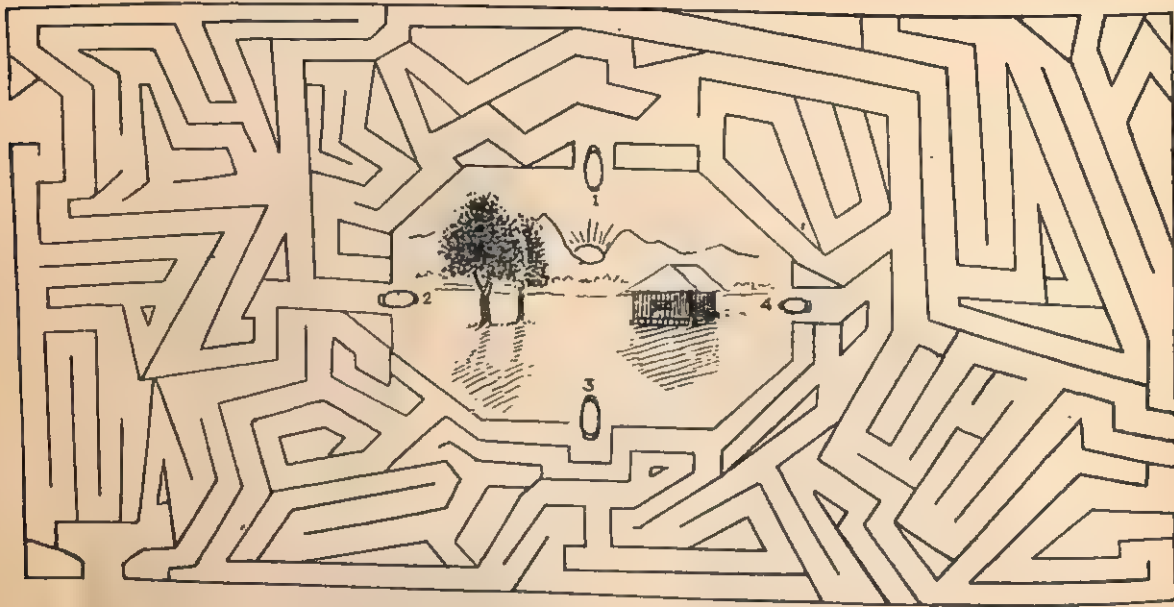


NAME _____ CLASS _____ DATE _____

3. Have all these shadows been drawn correctly? If you think a shadow has been drawn incorrectly, draw it again. After you have done this, have fun colouring the scene.



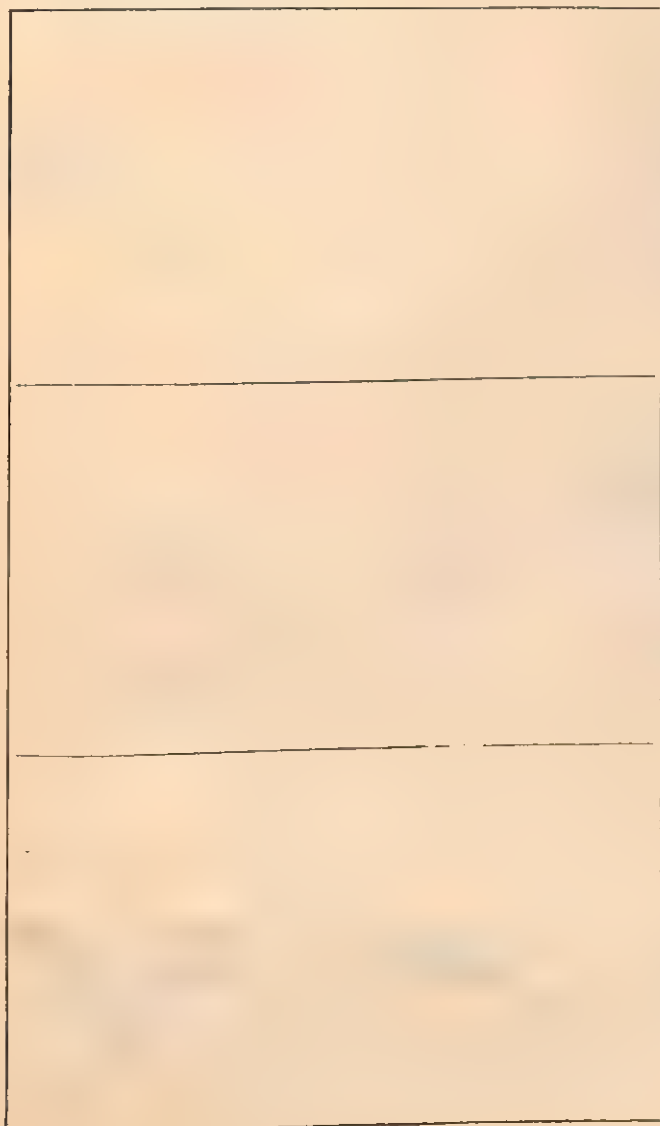
4. Four cars are seen at dawn about to begin their journey along this maze of roads. Each car has been given a number. Study the picture very carefully and then fill in the table given below the picture.



Car Number	<i>The direction in which it is about to move</i>	<i>The direction it will face when it leaves the frame</i>
1		
2		
3		
4		

The Three Seasons

1. Make coloured drawings in each box as indicated by the captions.












Woolly clouds high
over hills

Rain falling from
monsoon clouds and
running into small
streams in hills

The sun peeping over
the top of summer
clouds

2. Keep a record of the weather for five days. Try to do this during the monsoon season to obtain the most interesting results. Choose one of the pictures given below the table and draw it in the proper box according to the weather.

<i>The day</i>	<i>Morning</i>	<i>Afternoon</i>	<i>Evening</i>
Monday			
Tuesday			
Wednesday			
Thursday			
Friday			

								
Sunny	Windy	Stormy	Lightning	Partly Cloudy	Cloudy	Rainy	Floods	Rainbow

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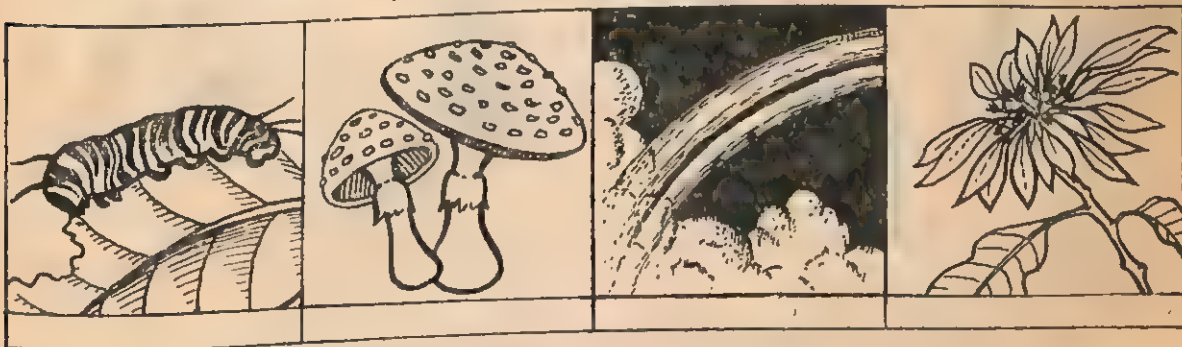
3. On page 28 there are several words which describe weather conditions. How many other words which describe the weather do you know? Write them on the lines below.

4. Look at these pictures. Write Summer, Winter or Monsoon in the proper space.

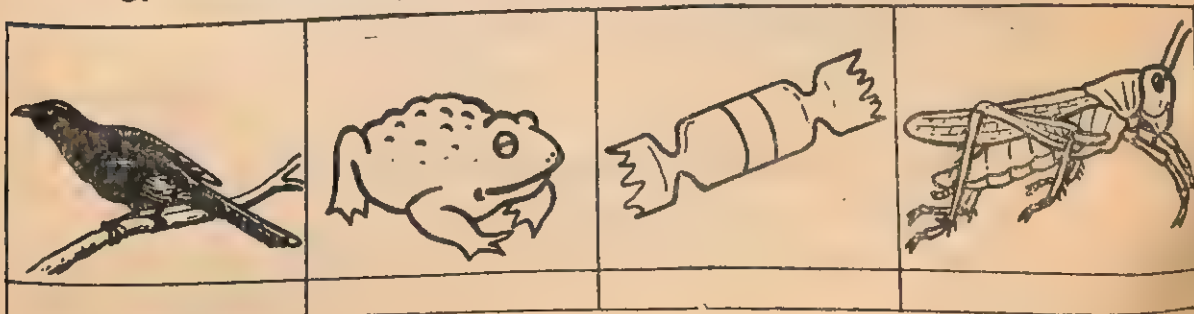
a. When do you wear these things?



b. When do you see these things?



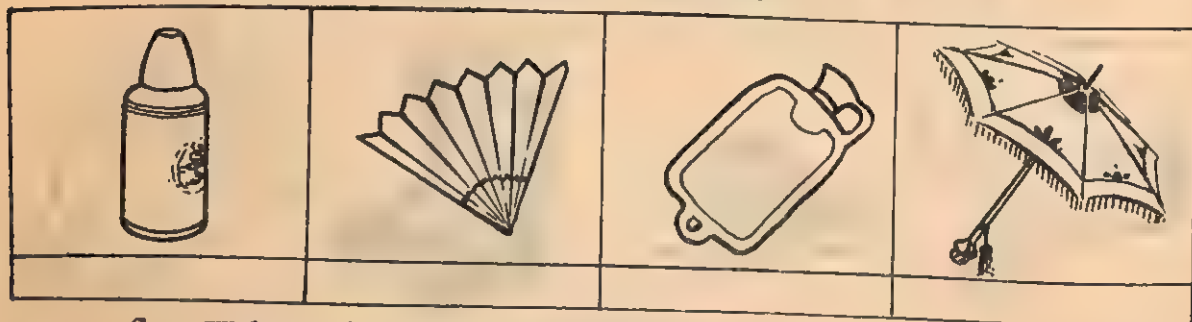
c. When do you hear these things?



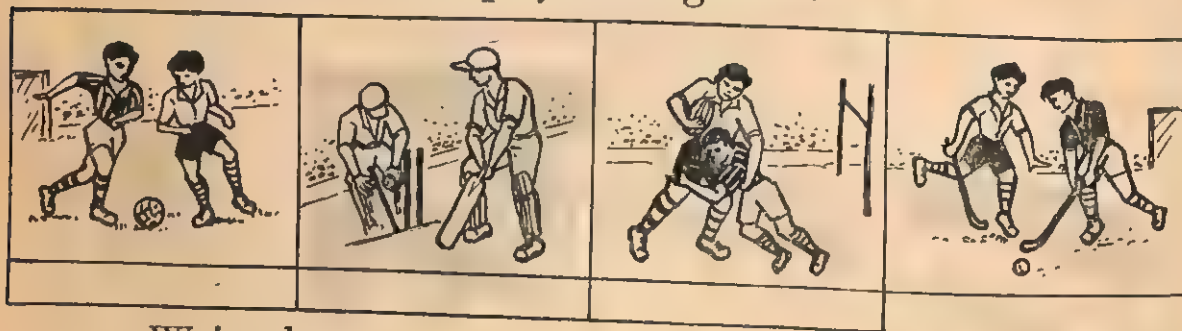
d. When do you eat these things ?



e. When do you use these things ?



f. When do you play these games ?



5. Write down :

a. Three reasons why you like the monsoon.

i. _____

ii. _____

iii. _____

b. Three reasons why you dislike the monsoon.

i. _____

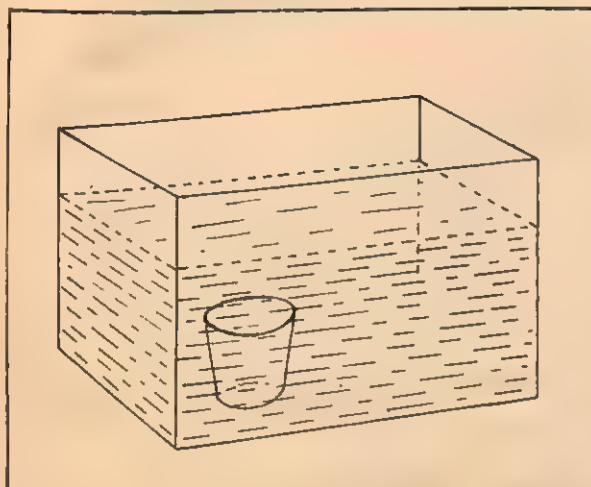
ii. _____

iii. _____

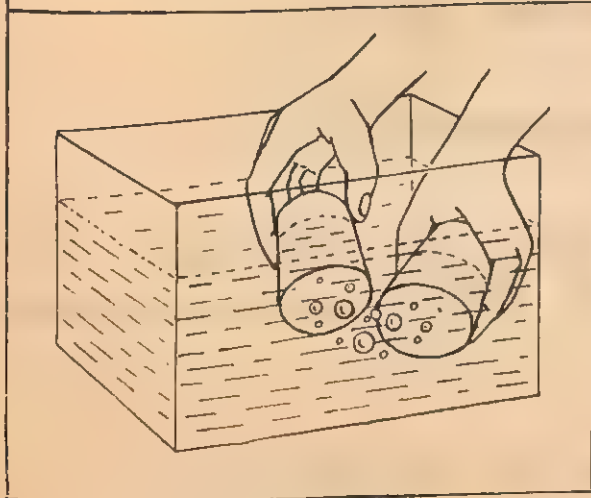
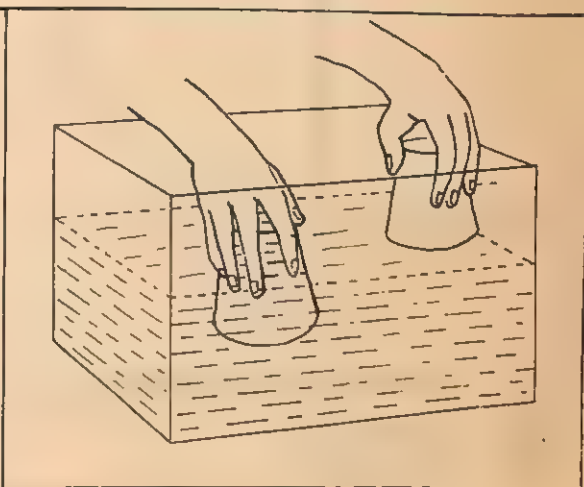
Moving Air

1. This series of pictures show you how to transfer air from one tumbler to another containing water. See if you can do it.

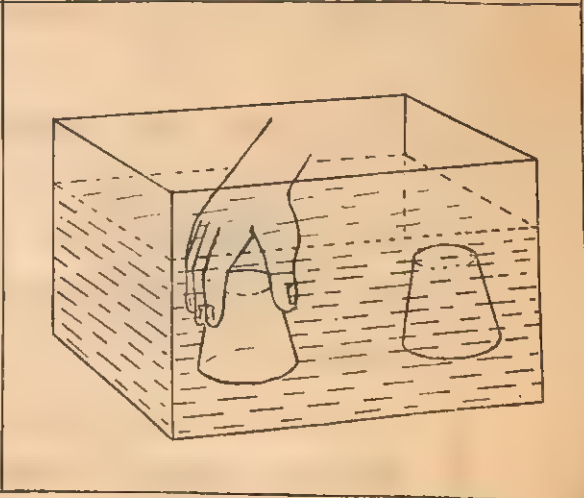
First Step



Second Step

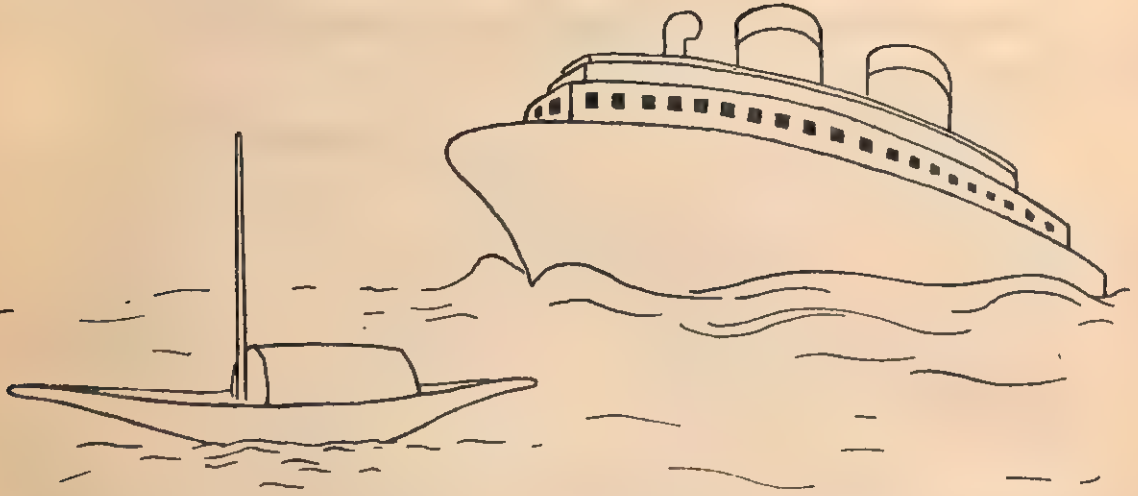


Third Step



Fourth Step

2. In this picture the wind is blowing in the direction of the arrow. Draw a flag on top of the mast of the small boat and fill in its sails. Draw smoke coming out of the ship's funnels. Colour the picture.



3. Study the pictures on the next page, then answer these questions.

A. Why does no water enter the bottle?

B. Why does the handkerchief remain dry?

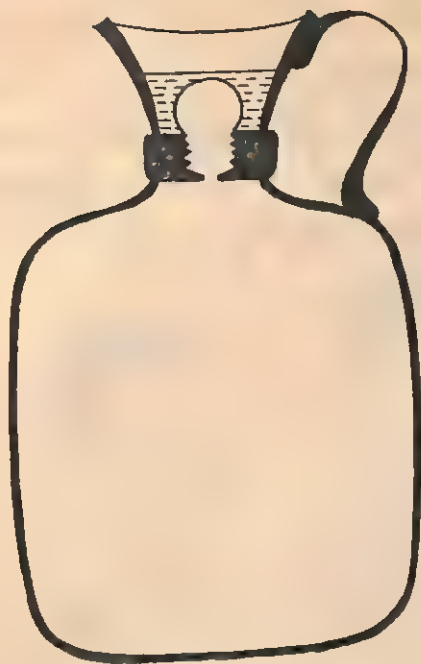
C. How would you make the cork go to the bottom of the bowl without touching it with anything?

D. Which object is the 'odd one out'?

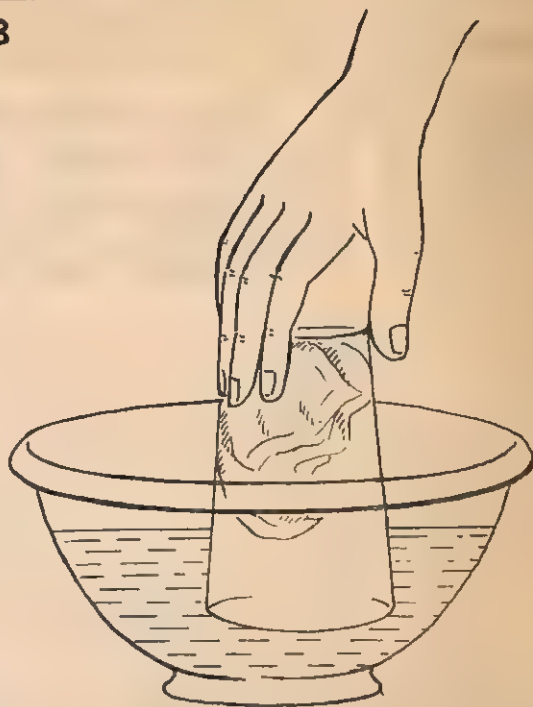
NAME _____

CLASS _____ DATE _____

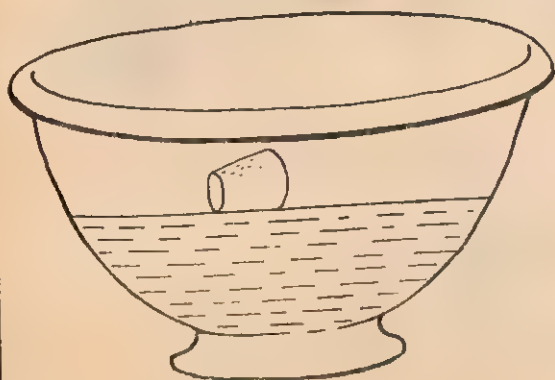
A



B



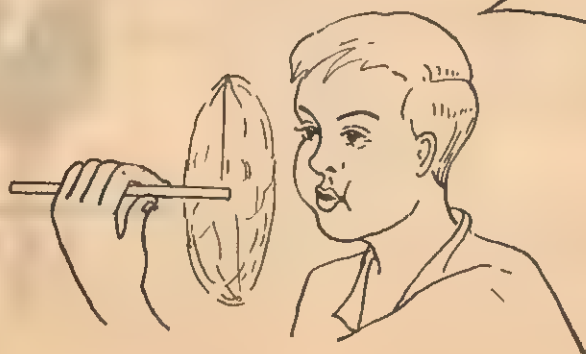
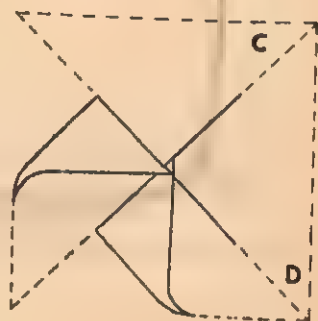
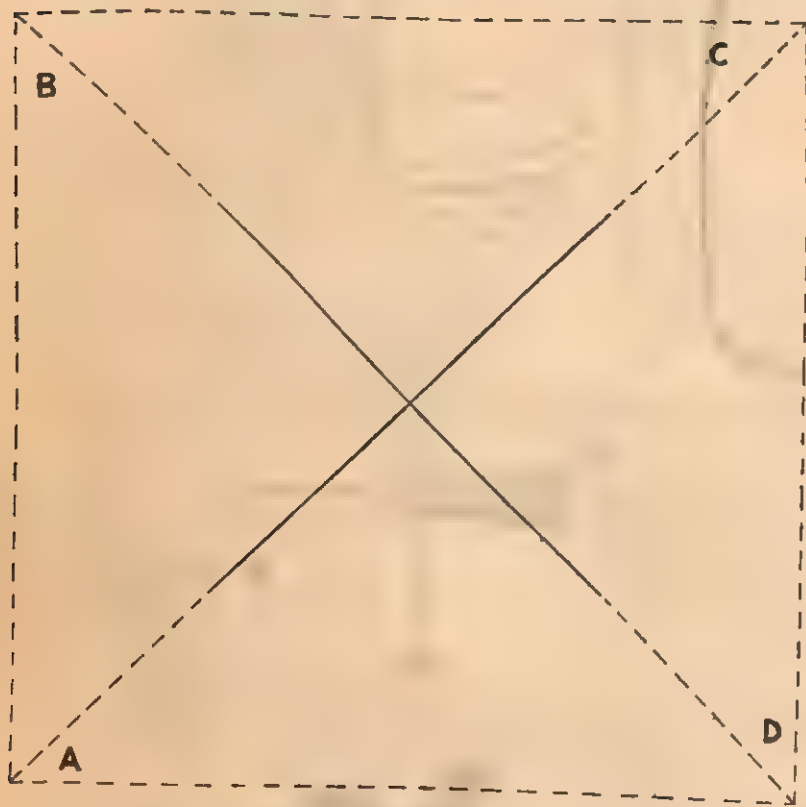
C



D



4. Trace this design on a stiff sheet of paper. Colour each part a different colour. Now colour the reverse using the same colours for each part. Cut along the dotted lines. Place A over the centre, B over A, C over B and D over C. Push a pin through these four points and then into the end of a thin stick. Use the pinwheel you have made to tell the direction of the wind.



Pets

1. The boy on the right does seem to have brought a strange pet to the pet show. It is made up of the parts of four animals. Can you name them?



2. List five things a pet needs in order to be healthy.

- i. _____
- ii. _____
- iii. _____
- iv. _____
- v. _____

3. If you have visited the zoo, these animals should not be too difficult to name. Mark a star next to those that are related to the cat, a dagger next to those related to the dog and a circle next to those related to the rabbit.

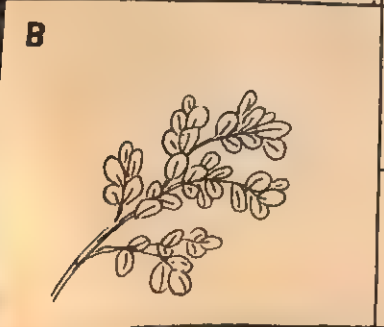
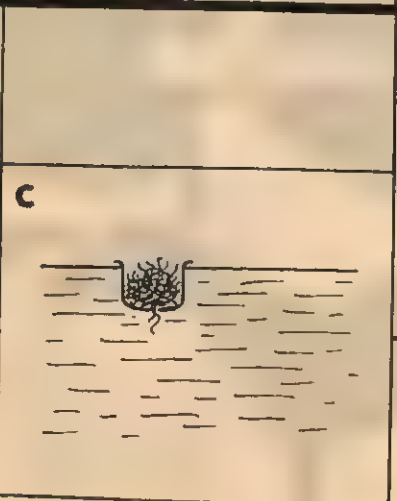
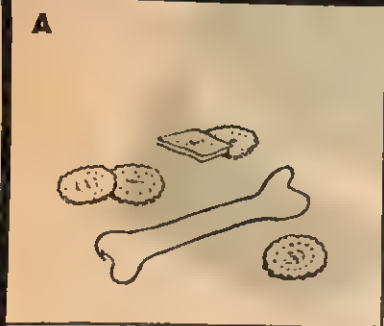
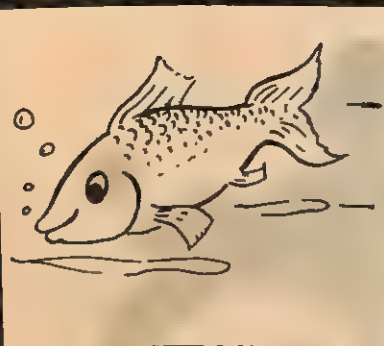


NAME _____ CLASS _____ DATE _____

4. Fill in this crossword puzzle with the names of the different breeds of dogs as shown in outline. Letters have been put in the puzzle to help you.



5. In the first set of boxes are a number of animals kept by people as pets. The second set of boxes contain the food eaten by these animals. Select the particular food eaten by an animal and write the letter of its box in that of the animal.



NAME _____ CLASS _____ DATE _____

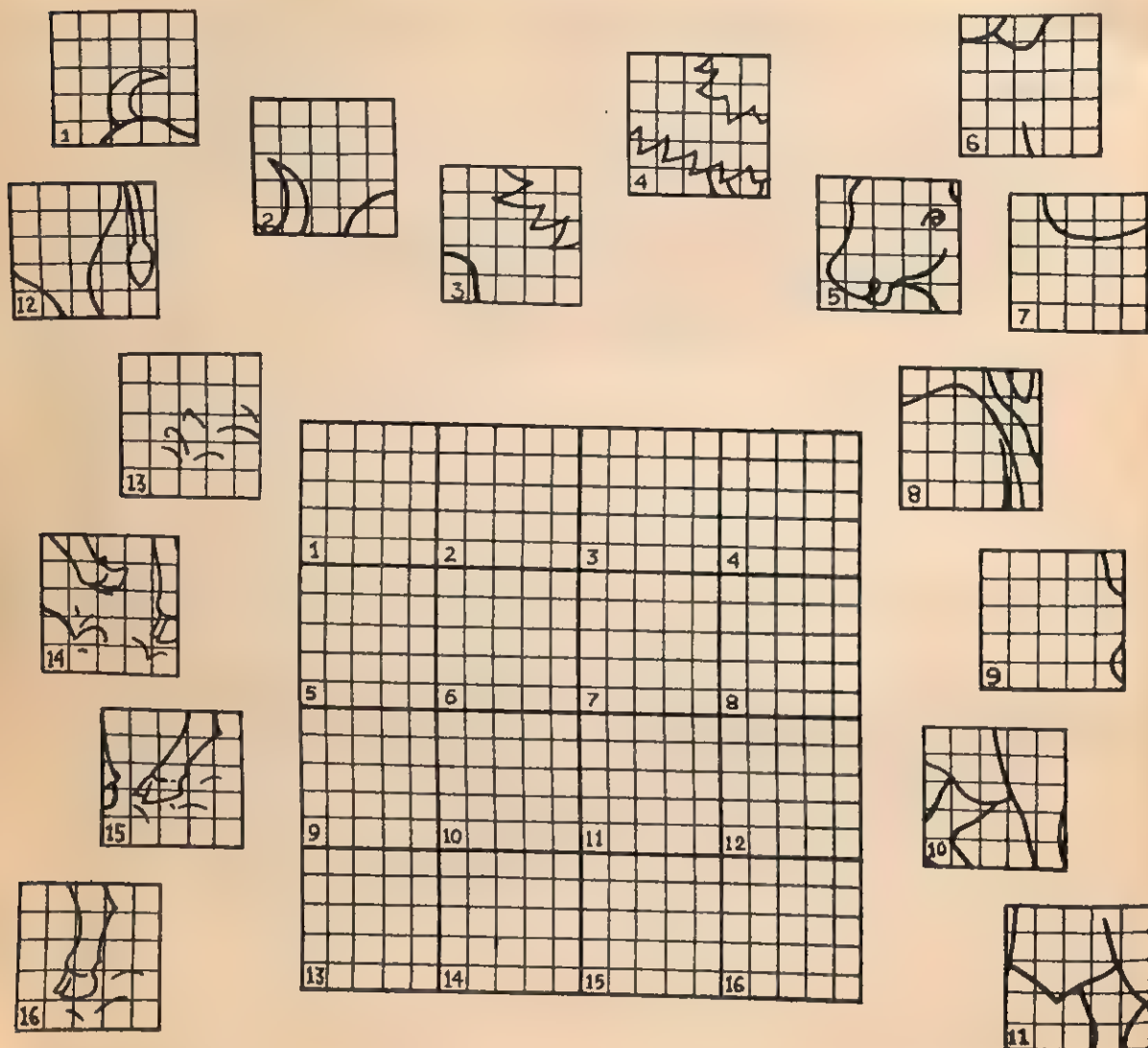
10

A Useful Animal

1. Draw in each box a thing which we obtain from the cow.

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	100
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	100
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	100
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	100
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	100
1	2	3	4	5	6	7	8	9	10	11	12	13</																																																																																							

2. Draw this patchwork picture. Copy the lines in block 1 into the block marked 1 on the big square. Repeat this with all the other blocks. Write your guess of what you think the drawing will be on the first line, and a caption of the completed drawing on the second line.



3. Fill in this crossword puzzle.

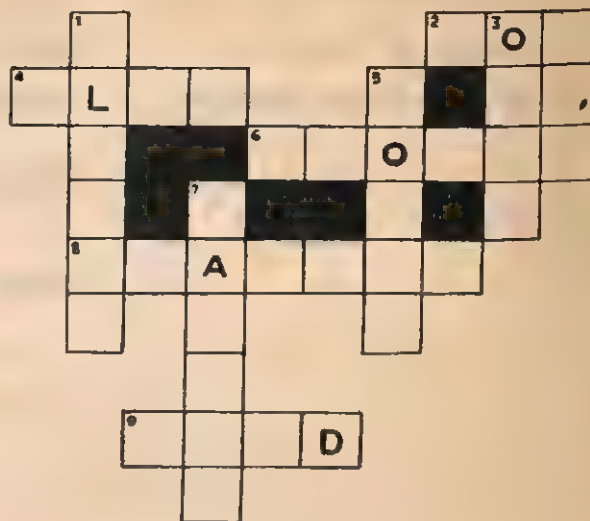
Clues Across

2. Call of the cow.
4. Made by boiling the hooves and horns of a cow.
6. A cow's hoof is this.
8. Cows feeding in pasture.

9. A group of cows.

Clues Down

1. Oxen are used to pull this across the fields.
7. A long, hollow tray from which cows are fed.
5. Used by the cow to defend itself.
3. They are used to pull carts.
4. Draw a line from the name of each animal to the picture of its hoof and draw another line to the picture of its tail.



COW



HORSE



GOAT



PIG



5. Here is a list of animals you might see on a farm.

Complete the table by filling in the blank spaces.

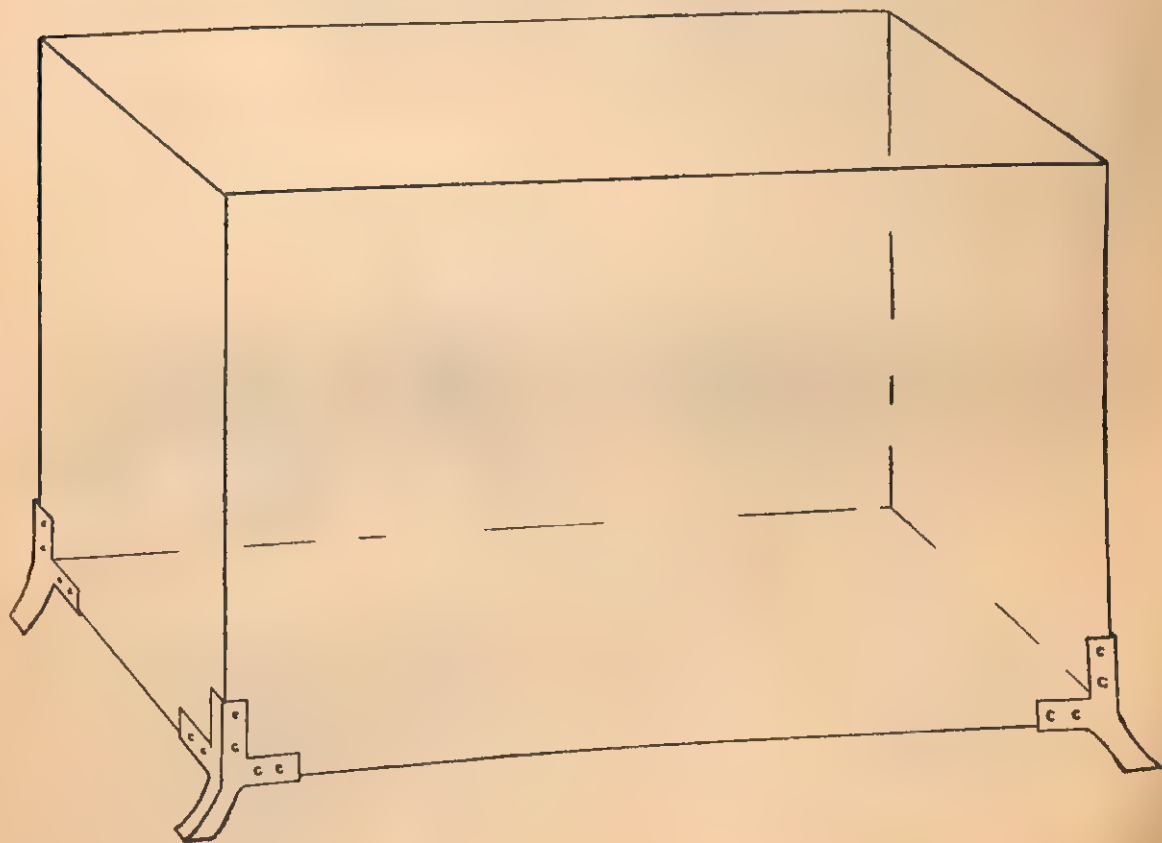
Kind of food fed to it by the farmer	Name of animal	Its usefulness to the farmer
	Chicken	
	Duck	
	Goose	
	Cow	
	Ox	
	Buffalo	
	Horse	
	Goat	
	Sheep	
	Pig	
	Cat	
	Dog	

An Underwater Garden

I. Make this empty container into an underwater garden. Fill in the following :

Water. Water plants. Sand. Shells.. Fish.

*An insect on the water surface. A snail
on the inner walls of the container.*



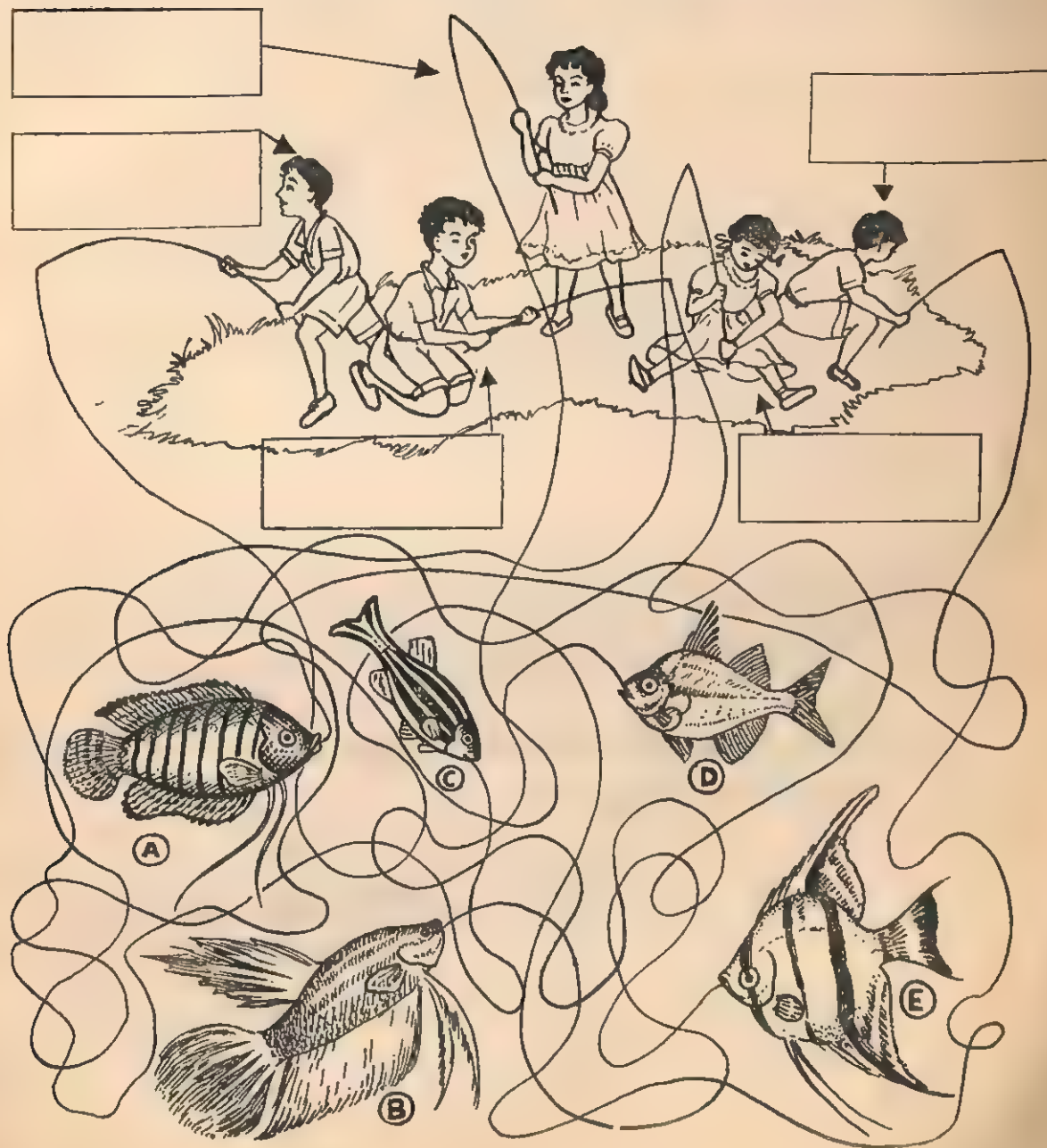
2. Write a short account of how the fish breathes.

3. Explain, in your own words, how you would change the water of a fish bowl.

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4. These fish are often seen in fish bowls. Their names have been wrongly spelt. Correct each name and write it in the blank space which points to the child who has caught it.

A. DARWF GOUARIM. B. SMAIESE FGHITER.
C. ZBEAR FSIH. D. GALSS FHIS. E. AGNLE FHSI.



5. Draw the following parts of a fish as indicated by the letters in the boxes.

- a. Tail fin. b. Scales. c. Gills. d. Back fin.
e. Head. f. Belly fin.

a	b	c
d	e	f

6. Name :

- a. Three different kinds of animals whose bodies are covered with scales.
i. _____ ii. _____ iii. _____
- b. Three different kinds of animals that feed on fish.
i. _____ ii. _____ iii. _____
- c. Three different kinds of animals that live in water.
i. _____ ii. _____ iii. _____

Test Yourself on the Year's Work

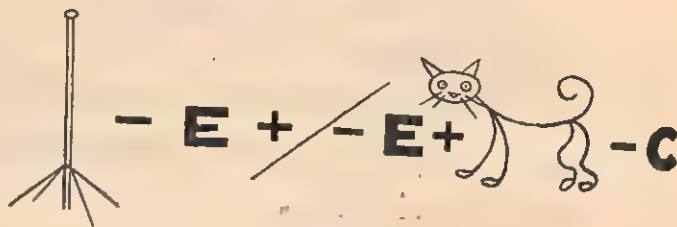
I. Go through the alphabet, testing yourself letter by letter. The number in brackets gives the number of letters in the single word answer.

- A. For fish to live, water must have this. (3) _____
- B. A beautiful garden insect. (9) _____
- C. The baby of the cow. (4) _____
- D. A light shower of rain. (7) _____
- E. A snake-like fish. (3) _____
- F. This forms after pollen has fallen on the pistil. (5) _____
- G. Made by boiling the hooves and horns of a cow.
(4) _____
- H. The skin of the cow. (4) _____
- I. Visitors needed by the flower to change to fruits.
(7) _____
- J. Worn by boys in the winter. (6) _____
- K. A bird that tells us that summer has arrived. (4) _____
- L. A common garden animal that has a coat of scales.
(6) _____
- M. An animal which lives in the branches of a tree.
(6) _____
- N. The sweet juice in a flower. (6) _____
- O. A shell-fish which may contain a pearl. (6) _____
- P. Another name for seed-box. (6) _____
- Q. The sound of the duck. (5) _____
- R. A number of streams join to form one. (5) _____
- S. It changes in length every hour of the day. (6) _____
- T. It joins the leaves of a tree to its roots. (5) _____

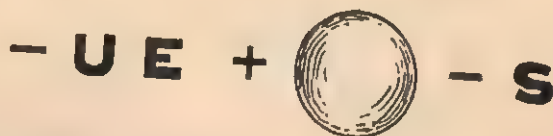
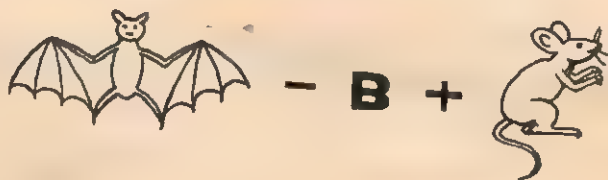
- U. Very much required in the monsoon. (8) _____
 V. It helps to tell the direction of the wind. (4) _____
 W. All living things require this to live. (5) _____
 X. A winter festival. (4) _____
 Y. Some fishes continually do this. (4) _____
 Z. Where wild animals are kept by man. (3) _____

2. The pictures in the following puzzles suggest certain words. Add and subtract the letters of these words to the other letters in the puzzles as indicated. The clue to each puzzle is given at the left of it.

*The carrying
 of pollen
 from flower
 to flower*



*The air
 around us*




*An underwater
garden*

A + - SE + I

+  - DR

--	--	--	--	--	--	--	--

*A shadow
portrait*


6 - X + L + 

- S + T + 10 - N

--	--	--	--	--	--	--	--	--	--

*The birth
of a baby plant*

 - M +  - WO +  - T

+  - H + I + 1 - E

--	--	--	--	--	--	--	--	--	--

3. Study the picture on the page facing this one. How many of these questions can you answer? When you have answered the questions, colour the scene.

a. Name the plants numbered as follows :

i. _____ ii. _____ iii. _____

iv. _____ v. _____ vi. _____

b. Which of these plants bear fruits which we eat ?

c. What is the butterfly doing ?

d. What time of the day is it ?

e. What sign tells us the direction of the wind ?

f. What season of the year is it ?

g. Name the kind of cloud.

h. What is the cow doing ?

i. What is the name of the fish caught by the boy ?

j. Give the picture a caption.



4. a. This picture is incomplete. All its lines and curves are in the audience. Pick out the lines and curves as shown by their numbers and copy them exactly into their correct places in the dot-to-dot picture.

b. Colour the completed picture.

c. Fill in the crossword puzzle about what came out of the magician's hat. 1. Its name. 2. Farmers dislike it because it eats this. 3. Its call. 4. Its food when kept as a pet. 5. It can be taught to do this.



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